EMC TEST REPORT

Report Number	:	**68.760.11.314.01**	Date of Issue:	November 04, 2011

Model / Serial No.	:	RRU3004
Product Type	:	Remote Radio Unit of GSM Distributed Base Station
Applicant	:	Huawei Technologies Co., Ltd.
Address		Administration Building, Huawei Base, Bantian Longgang, District Shenzhen, P.R. China
Production Facility	:	Huawei Technologies Co., Ltd.
Address	:	Administration Building, Huawei Base, Bantian Longgang, District Shenzhen, P.R. China
Test Result	:	■ **Positive** ☐ **Negative**
Total pages including Appendices	:	**44**

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1 General Information

1.1 Notes

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Approved By	**2011-11-04**	**Louis Lin**	
EMC Technical Certifier	**Date**	**Name**	**Signature**
Reviewed By	**2011-09-08**	**Zhang Xinghai**	
EMC Laboratory Manager	**Date**	**Name**	**Signature**
Prepared By	**2010-09-07**	**Zhang Jintao**	
EMC Test Engineer	**Date**	**Name**	**Signature**

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1.2 Testing Laboratory

Test location:
Location1:

Reliability Laboratory of Huawei Technologies Co., Ltd.

Address: Huawei Base, Bantian, Longgang District, Shenzhen 518129, P.R. China

Phone: +86-755-89651014
FAX: +86-755-89652518

1.3 Details of Applicant

CLIENT: Huawei Technologies Co., Ltd.

Product Name: Remote Radio Unit of GSM Distributed Base Station

Product Model: RRU3004

Test Number: SYBH (E) 106082011

Version: V100R013

1.4 Application Details

Date of receipt of order: Aug.13, 2011
Date of receipt of test item: Aug.15, 2011
Date of test: Aug.20, 2011~ Aug.31, 2011

1.5 Test Item

Refer to table 1.

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1.6 Applied Standard	
Applied Product Standard:	EN 55022:2006+A1:2007 CISPR 22:2008 EN 55024:1998+ A1:2001 + A2:2003 CISPR 24:1997+ A1:2001+A2: 2002 EN 50121-1:2006 EN 50121-4:2006 ETSI EN 301 489-1 V1.8.1:2008 ETSI EN 301 489-8 V1.2.1:2002 ETSI EN 301 502 V9.2.1:2010-10 VCCI V-3:2010 ICES-003:2004 AS/NZS CISPR 22:2009 IEC 61000-6-1:2005/EN 61000-6-1:2007 IEC 61000-6-3:2006/EN 61000-6-3:2007
Test Methods:	ANSI C63.4: 2003 ITU-R SM.329-11:2011 VCCI V-4: 2010 IEC 61000-4-2:2008 IEC 61000-4-3:2010 IEC 61000-4-4:2004+A1:2010 IEC 61000-4-5:2005 IEC 61000-4-6:2008 IEC 61000-4-8:2001 IEC 61000-4-29:2000
1.7 Test Location	
Test Location 1:	Reliability Laboratory of Huawei Technologies Co., Ltd.
Address:	Huawei Base, Bantian, Longgang District, Shenzhen 518129, P.R. China
1.8 Test Environment Condition	
Ambient Temperature:	20-25°C
Relative Humidity:	45-55%
Atmospheric Pressure:	101kPa

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2 Summary of Test Results

Table 1 Summary of test result

EUT Classification： Radio Equipment					
Test Items	**Test Configuration**	**Performance Criteria**		**Test Result**	**Location**
Radiated Emissions Enclosure Port	TC1,TC2	Class B		Pass	Location1
Radiated Spurious Emissions Enclosure Port	TC1,TC2	Refer to section 10.2		Pass	Location1
Conducted Emissions ☒DC Power Port ☐AC Power Port ☐Telecommunication Ports	TC1,TC2	Class B		Pass	Location1
Electrostatic Discharge Enclosure Port	TC1,TC2	TT&TR		Pass	Location1
Immunity to Radiated Electromagnetic Fields Enclosure Port	TC1,TC2	CT&CR		Pass	Location1
Immunity to Electrical Fast Transient Bursts ☐Outdoor Signal Port ☐Indoor Signal Port ☐AC Power Port ☒DC Power Port	TC1,TC2	CT&CR		Pass	Location1
Immunity to Surges ☐Outdoor Signal Port ☐Indoor Signal Port ☐AC Power Port ☒DC Power Port	TC1,TC2	TT&TR		Pass	Location1
Immunity to Continuous Conducted Interference ☐Outdoor Signal Port ☐Indoor Signal Port ☐AC Power Port ☒DC Power Port	TC1,TC2	CT&CR		Pass	Location1
Immunity to Power Frequency Magnetic Field Enclosure Port	TC1,TC2	CT&CR		NT*	Location1
Immunity to Pulsed Magnetic Field Enclosure Port	TC1,TC2	TT&TR		Pass	Location1
Immunity to Voltage dips and Short Interruption and Voltage Variation DC Power Port	TC1,TC2	A/C	☐With battery ☒Without battery	Pass	Location1
Note: 1, Measurement taken is within the uncertainty of measurement system. 2, TC = Test configuration 3, NT=not tested. The equipment under test (EUT) has been exempted from immunity tests for power frequency of magnetic fields because the device does not contain any components that are susceptible to magnetic fields. 4, ☒ The item has been tested; ☐ The item has not been tested.					

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3 Equipment Specification

3.1 General Description

The RRU3004 is an outdoor remote RF unit. It processes baseband signals and RF signals.
The functions of the RRU3004 are as follows:
The direct frequency conversion technique, which is directly implemented in the transmit channel, modulates the baseband signals into GSM RF signals. After being filtered and amplified, the RF signals are transmitted to the antenna for transmission, through the duplexer in the RF front-end unit. The uplink RF signals received from the antenna go through down-conversion, amplification, analog-to-digital conversion, matched filtering, Automatic Gain Control (AGC), and then sent to the BBU3036 or macro BTS for further processing.

3.2 Specification

Table 2 Main Equipment Specification

Input rated voltage	⎓ -48 V
Rated power	GSM900: Max 300 W DCS1800: Max 330 W
Dimensions	380 mm (W) x 130 mm (D) x 485 mm (H)
Weight	17 kg
Transmit frequency	921 MHz~960 MHz (GSM900) 1805 MHz~1880 MHz (DCS1800)
Receive frequency	876 MHz~915 MHz (GSM900) 1710 MHz~1785 MHz (DCS1800)
Maximum output power	GSM900: 44.77 dBm DCS1800: 43.00 dBm
Frequency of the internal source	3.25 MHz, 50 MHz, 52 MHz, 104 MHz, 122.88 MHz

Figure 1.EUT Appearance

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3.3 Board and Sub-Assembly

Table 3 Board list

Board		
Board Name	Hardware Version	Description
GM59DBRU	VER.E	Dual Baseband and Radio Unit
GM59DPAU	VER.B	Dual Power Amplifier Unit
GM59DPAUB	VER.B	Dual Power Amplifier Unit
GMK9DBRU	VER.E	Dual Baseband and Radio Unit
GMK9DPAU	VER.A	Dual Power Amplifier Unit
GMK9DPAUB	VER.A	Dual Power Amplifier Unit
GM5EDRRU	VER.E	Dual Baseband and Radio Unit
RDDP	VER.B	Antenna Feed Module, RDDP
RDDE	VER.C	Antenna Feed Module, RDDE
RDDD	VER.B	Antenna Feed Module, RDDD
RDDR	VER.A	Antenna Feed Module, RDDR

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4 System Configuration during EMC Test

The Equipment under Test (EUT) was functioning correctly during all tests. The EUT was installed within the test site and was configured to simulate a typical configuration.

4.1 Ports and Cables

Table 4 Port and cables

Port	Quantity	Length (m)	Connector	Cable Type
DC power Port	1	3	OT Connector	Unshielded
Earth	1	2	OT Connector	Unshielded
CPRI	2	10	DLC	Fiber
ANT_TX/RX	2	5	DIN Male Connector	Shielded, RF Cable
RX_IN/OUT	2	5	DB2W2 Connector	Shielded, RF Cable

4.2 Auxiliary Equipment

Table 5 Auxiliary equipment

Name	Model	Manufacturer	S/N	Cal Date	Cal Interval (month)
Digital Communication Tester	CMU300	R&S	3604071145	2011-05-24	12
Personal Computer	PIII1G/128M/ 30G/15"	LEGEND	NA	NA	NA
30dB Attenuator	DTS100	Huaxiang Shanghai	04031818	NA	NA
100W Load	TF100-3	Huaxiang Shanghai	04101445 04101402	NA	NA
Base Band Units	BBU3900	Huawei	NA	NA	NA

4.3 Test Configurations

The equipment under test (EUT) was connected to ancillary devices in order to simulate normal operating conditions (with reference to the guidance given in the standard for this type of equipment). There were two test configurations. TC1 and TC2, as shown in the following table:

Configuration	Configuration Describe
TC1	RRU is configured in GSM900, -48 V DC Power supply
TC2	RRU is configured in DCS1800, -48 V DC Power supply

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4.4 Test conditions and connections

Emission test:

During Emission test, establish a communication link using one way RF port and one way E1 (with one TX/one RX). The remains RF input and output ports are terminated with 50Ω load, and the remains E1 are configured to self loop.

Every transmitter transmits with full power: for GSM900, 44.77dBm, For DCS1800, 43.00dBm (two carriers are active for one transmitter).The 2 carrier frequencies are set to uniform distribution in the TX band, the frequency number is:

For GSM900

Carrier No.	Channel No.
0	955
1	124

For DCS1800

Carrier No.	Channel No.
0	512
1	885

Immunity Test:

1) GSM mode
During immunity test, establish a communication link using one way RF port. The remains RF input and output ports are terminated with 50 Ω load. The wanted input signal level shall be set to a level where the performance is not limited by the receiver noise floor or strong signal affects (15 dB above the reference sensitivity level in current test), to provide a stable communication link. Here the output signal power of vector signal generator is -98dBm.

In order to assess the FER/BER of the bearer used during the immunity tests, the output of the transmitter shall be connected to the analyzer which meets the requirements for the FER/BER assessment of ETSI EN 301 502 V9.2.1 The level of the signal supplied to the equipment should be within the range for which the assessment of FER/BER is not impaired.

Power control function of EUT shall be shut off during the immunity testing.

4.4.1 Test Connections

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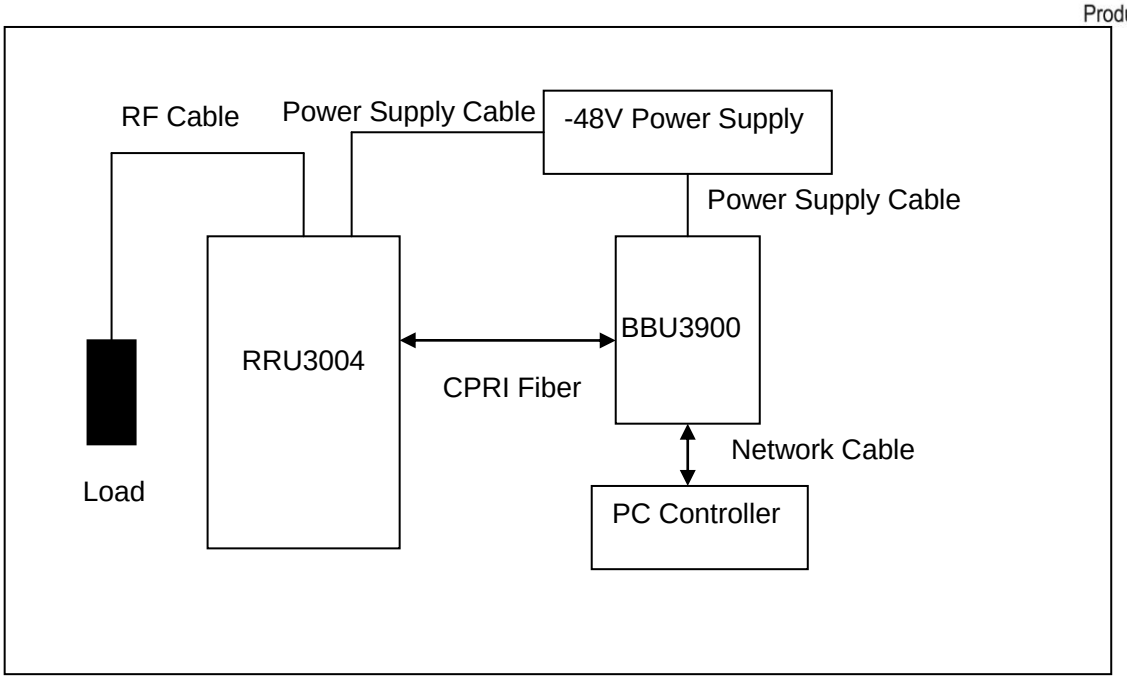

Figure 2.Test connection1 (TC1)

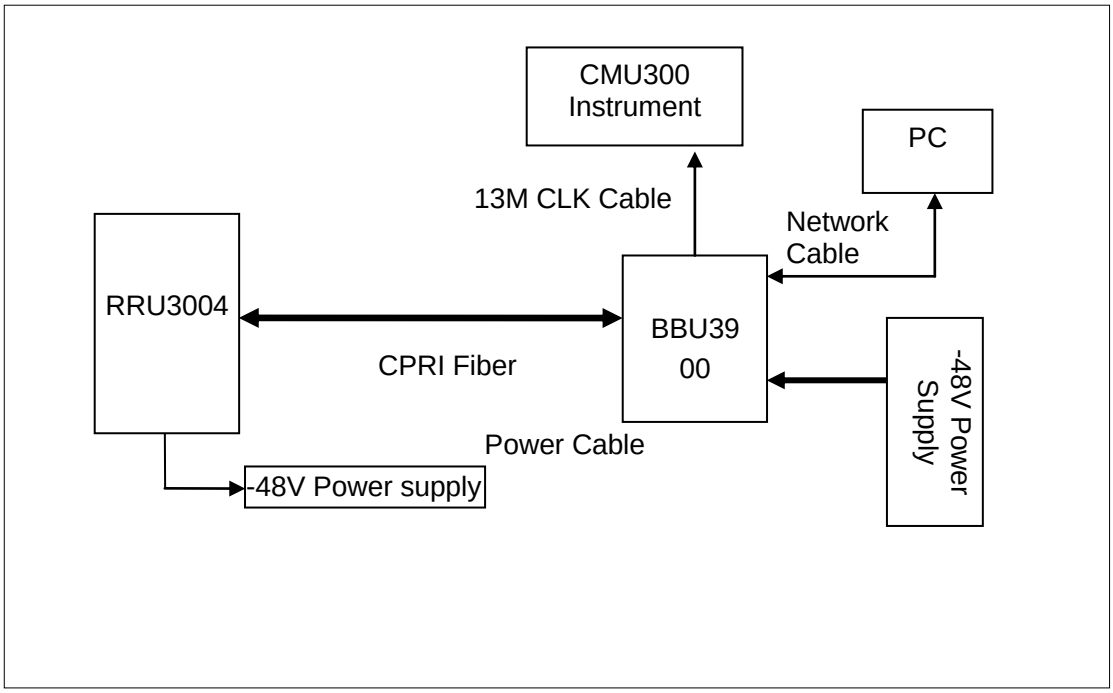

Figure 3.Test connection2 (TC2)

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5 Immunity Performance Criteria

During immunity test, the RRU3004 is to be monitored for compliance against the performance “CT/R, TT/R” criteria as appropriate for the particular test applied. The "pass/fail" performance criterion to be used during test is detailed below:

5.1 Performance Criterion CT&CR (Continuous Phenomena)

A communication link shall be established at the start of the test, and maintained during the test, the RXQUAL of the downlink shall not exceed the value of 3, measured during each individual exposure in the test sequence.

5.2 Performance Criterion TT&TR (Transient Phenomena)

A communications link shall be established at the start of the test.
At the conclusion of each exposure it shall be verified that the communications link has been maintained. At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended with no loss of user control functions or stored data, as declared by the manufacturer, and the communications link shall have been maintained.

5.3 Performance Criterion DC Voltage dips and interruptions

For a DC voltage dip and interruption test, the following performance criteria apply:

-in the case where the equipment is powered solely from the DC mains supply (without the use of a parallel battery back-up) volatile user data may have been lost and if applicable the communication link need not to be maintained and lost functions should be recoverable by user or operator; no unintentional responses shall occur at the end of the test.

For a Voltage variations corresponding to 80% variation level for the following performance criteria apply: the performance criteria for continuous phenomena CT/R shall apply.

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6 Electromagnetic Interference (EMI)

6.1 Radiated Emission 30 MHz to 6 GHz

6.1.1 Test Procedure

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB in accordance with the standards: ANSI C63.4 and CISPR 16-1-4. The test distance was 3 m for 30 MHz to 1 GHz.
The test site full-anechoic chamber has met the requirement of S_{VSWR} tolerance 6 dB in accordance with the standards: CISPR 16-1-4. The test distance was 3 m for 1 GHz to 6 GHz.
The set-up and test methods were in accordance with EN 55022/CISPR 22 standards

A preliminary scan and a final scan of the emissions were made from 30 MHz to 6 GHz by using test software script; the emissions were measured using Quasi-Peak Detector (30 MHz-1 GHz) and Average /Peak Detector (above 1 GHz). The maximal emission value was acquired by adjusting the antenna height, polarisation and turntable azimuth in accordance with the software set-up. Normally, the antenna height ranged from 1 m to 4 m, and the turntable azimuth ranged from 0°to 360°, The receive antenna has two polarizations: Vertical and Horizontal.

The test set-up diagram was shown as below:

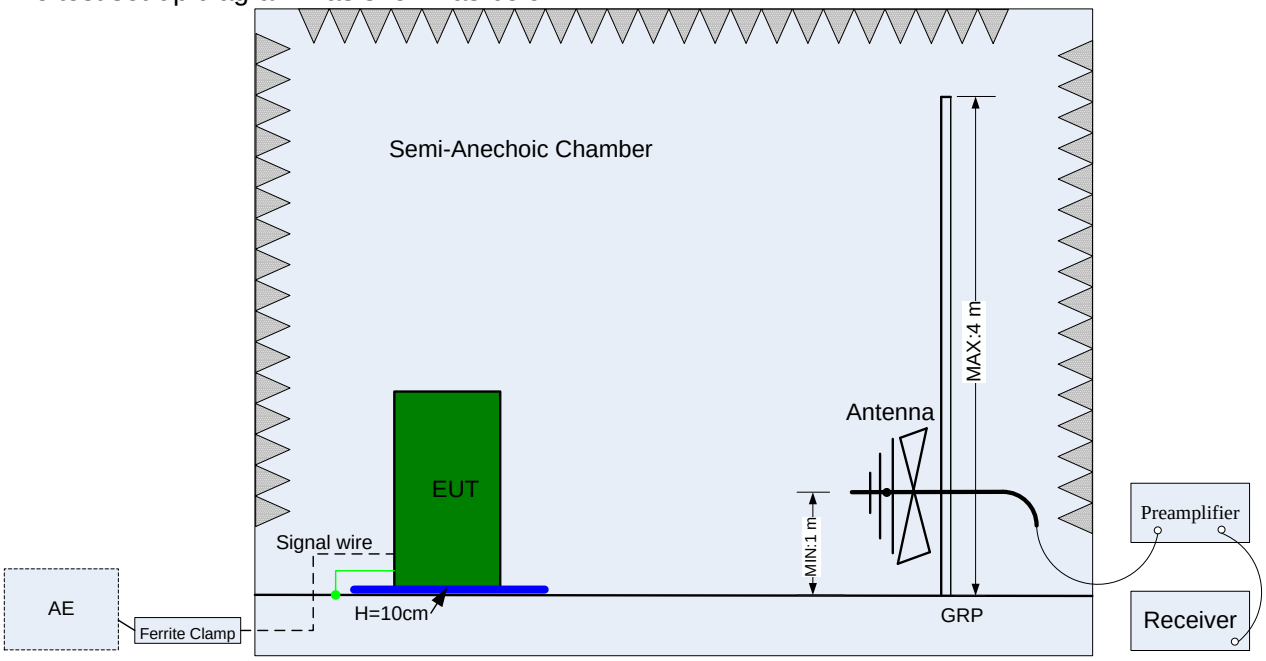

Figure 4.Test set-up of radiated disturbance (30MHz-1GHz)

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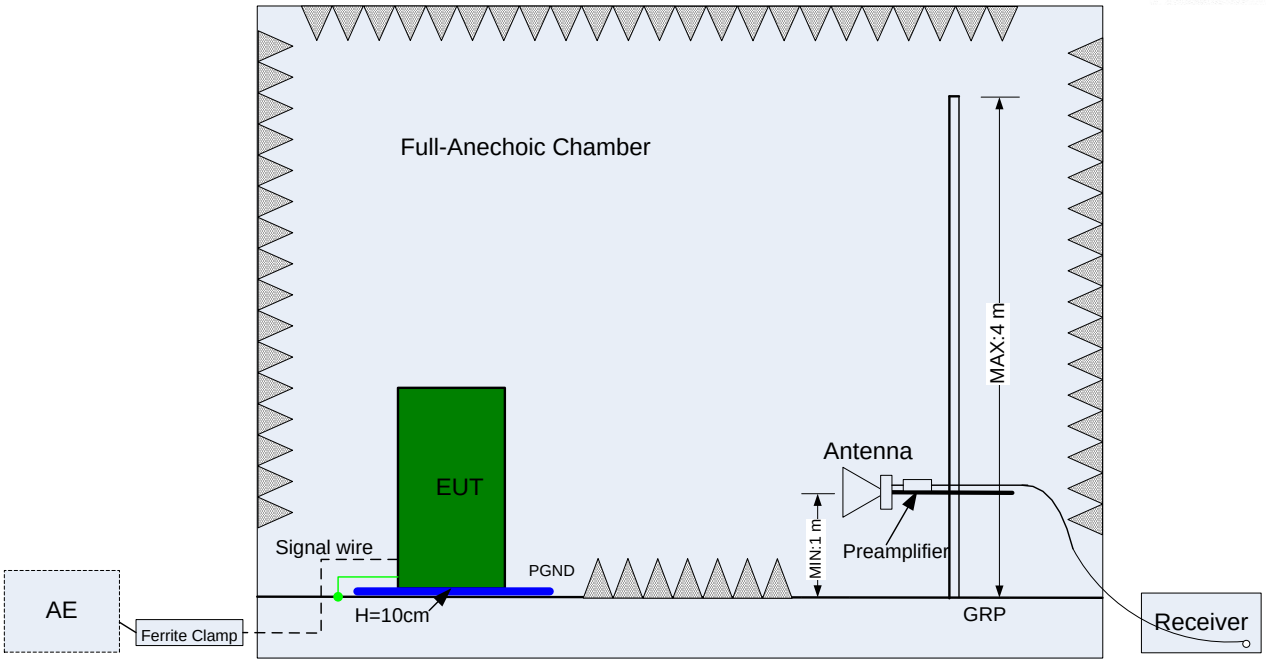

Figure 5.Test set-up of radiated disturbance (above 1GHz)

6.1.2 Test Results

The EUT has met the requirements for radiated emission of enclosure port.
For the test data, see section 10.1 in this report.

Table 6 Test limits of 30 MHz to 1 GHz

Frequency range	30 MHz to 1 GHz
Measuring distance	3 m
Classification	Class B
Limits(Class B)	30 MHz to 230 MHz 40 dBµV/m 230 MHz to 1 GHz 47 dBµV/m

Table 7 Test limits of 1GHz to 6GHz

Frequency range	1 to 6 GHz	
Measuring distance	3 m	
Classification	Class B	
Limits(Class B)	AV	PK
1 to 3 GHz	50 dBµV/m	70 dBµV/m
3 to 6 GHz	54 dBµV/m	74 dBµV/m

Note: The highest frequency of the internal sources of the EUT is 122.88 MHz, the measurement was made up to 6 GHz.

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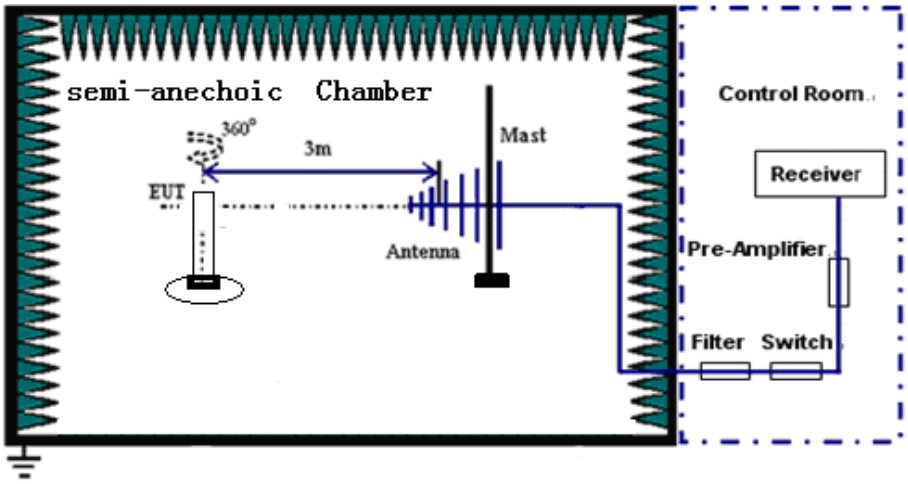
6.2 Radiated Spurious Emissions 30 MHz to 12.75 GHz

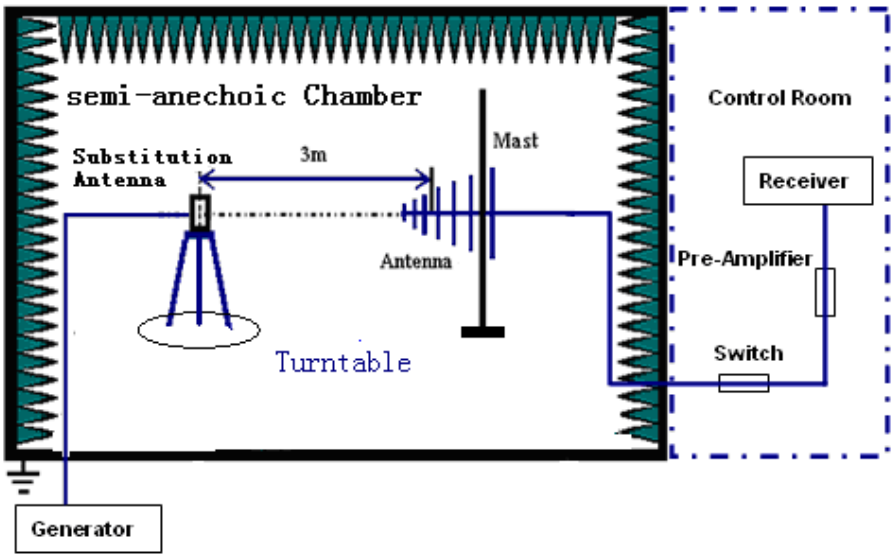
6.2.1 Test Procedure

A test site fulfilling the requirements of ITU-R Recommendation SM329-11 was used. The EUT was placed on a non-conducting support in the semi-anechoic chamber and was operated from a power source via an RF filter to avoid radiation from the power leads.

Step 1:
Radiation of any spurious components was detected by the test antenna and measuring receiver. Each frequency component was detected, the BSS was rotated and the height of the test antenna adjusted to obtain maximum response, and the effective radiated power (ERP) of that component determined by a substitution measurement. The measurement was repeated with the test antenna in the orthogonal polarization plane. Normally, the height range of antenna was 1m to 4m; the azimuth range of turntable is 0°to 360°.



Step 2:
Use substitution method to verify the maximum output power. The EUT is substituted by a dipole antenna. The dipole is connected to a signal generator. And then adjust the output level of the signal generator to get the same received power recorded in step 1 on Test Receiver, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.



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The RRU3004 was configured with all transmitter active, at its maximum output power 44.77dBm for GSM900, 43.00dBm for DCS1800, set the base station to transmit a signal as defined in the applicable part for measurement of spurious emissions.

6.2.2 Test Results

The EUT has met the requirements of Radiated Spurious Emissions of enclosure port.
The test data see section 10.2 of this report.

Table 8 Radiated spurious emissions limits of GSM

Frequency band (MHz)			Minimum requirement (E.R.P)	RBW
IN BAND			-36 dBm	30 kHz
OUT BAND	0.1 to 50 MHz			10 kHz
	Offset from edge of the relevant transmit band			
	50 to 500 MHz	⩾2		30 kHz
		⩾5		100 kHz
	500 to 1000 MHz	⩾2		30 kHz
		⩾5		100 kHz
		⩾10		300 kHz
		⩾20		1 MHz
		⩾30		3 MHz
	1000 to 12750 MHz	⩾2	-30 dBm	30 kHz
		⩾5		100 kHz
		⩾10		300 kHz
		⩾20		1 MHz
		⩾30		3 MHz

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6.3 Conducted Disturbance 0.15 MHz to 30 MHz

6.3.1 Test Procedure

The EUT was configured as described in section 4 for this test. The mains cable of the EUT must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8 m from the LISN.

All telecommunication and signal ports must be correctly terminated using either appropriate associated equipment or a representative termination during the measurement of the conducted disturbances at the mains.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.

The set-up of Conducted Disturbance for power port and telecommunication port were in accordance with EN 55022/CISPR 22 standards. The test set-up diagram was shown as below:

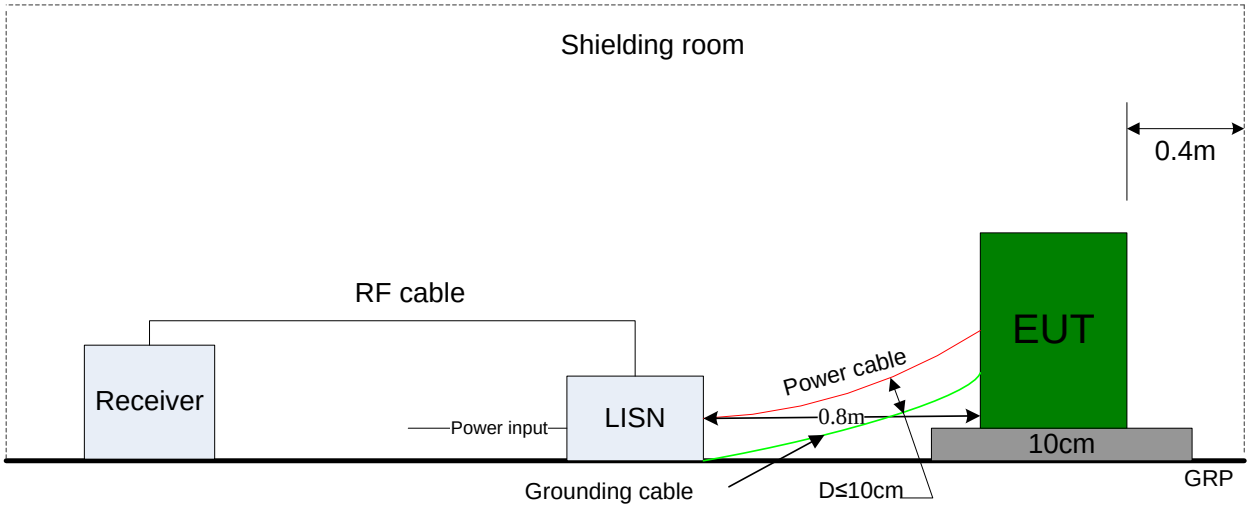

Figure 6.Test set-up of conducted disturbance for power port

6.3.2 Test Results

The EUT has met requirements for Conducted disturbance.
For the test data, see section 10.3 in this report.

Table 9 Limits of DC power port

Frequency range	150 kHz to 30 MHz	
Classification	Class B	
Limit(Class B)	Voltage limits (dBμV)	
	QP	AV
0.15 to 0.5 MHz	66 to 56	56 to 46
0.5 to 5 MHz	56	46
5 to 30 MHz	60	50

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7 Electromagnetic Susceptibility (EMS)

7.1 Electrostatic Discharge

7.1.1 Test Procedure

The EUT was configured as described in section 4 for this test. The set-up and test methods were in accordance with IEC 61000-4-2 standard.
The test environment condition was recorded in the following table:

Table 10 Test environment condition during ESD test

Ambient temperature	25°C
Relative humidity	50%
Atmospheric pressure	101kPa

The test set-up diagram was shown as below:

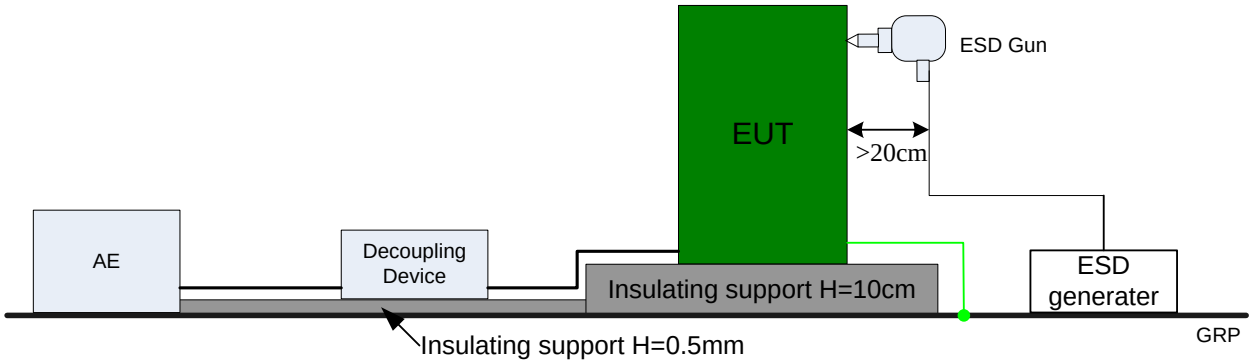

Figure 7.Test set-up of electrostatic discharge

7.1.2 Test Results

The EUT has met the requirements of Performance Criterion TT&TR defined in chapter 5.
All of the discharge points were presented in the table below, each discharge point was tested for 20 times (10 times for positive and negative), the minimum discharge interval was 1 second.

Table 11 Test results

Test Points	Specification Level				Conclusion
	±2 kV,±4 kV, ±6 kV Contact Discharges		±2 kV,±4 kV, ±8 kV Air Discharges		
	Positive	Negative	Positive	Negative	
Vertical Coupling Plane-front	√	√	N/A	N/A	Pass
Vertical Coupling Plane-rear	√	√	N/A	N/A	Pass
Vertical Coupling Plane-left	√	√	N/A	N/A	Pass
Vertical Coupling Plane-right	√	√	N/A	N/A	Pass
Rack enclosure	√	√	N/A	N/A	Pass
Connectors	√	√	N/A	N/A	Pass
Screw of frames	√	√	N/A	N/A	Pass
The board panel	√	√	N/A	N/A	Pass
Board gap	N/A	N/A	√	√	Pass

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Radiator hole	N/A	N/A	√	√	Pass
Indication lamp	N/A	N/A	√*	√*	Pass

Note:
√ The EUT's performance was not impaired at this test point when the ESD pulse was applied.
√* Pulse applied, but no discharge occurred.

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7.2 Immunity to Radiated Electric Fields 80 MHz to 2700 MHz

7.2.1 Test Procedure

The EUT was configured as described in section 4. The set-up and test methods were in accordance with IEC 61000-4-3 standard. All sides of the EUT (front, rear, left and right) were tested using an antenna with vertical and horizontal polarization.
The test set-up diagram was shown as below:

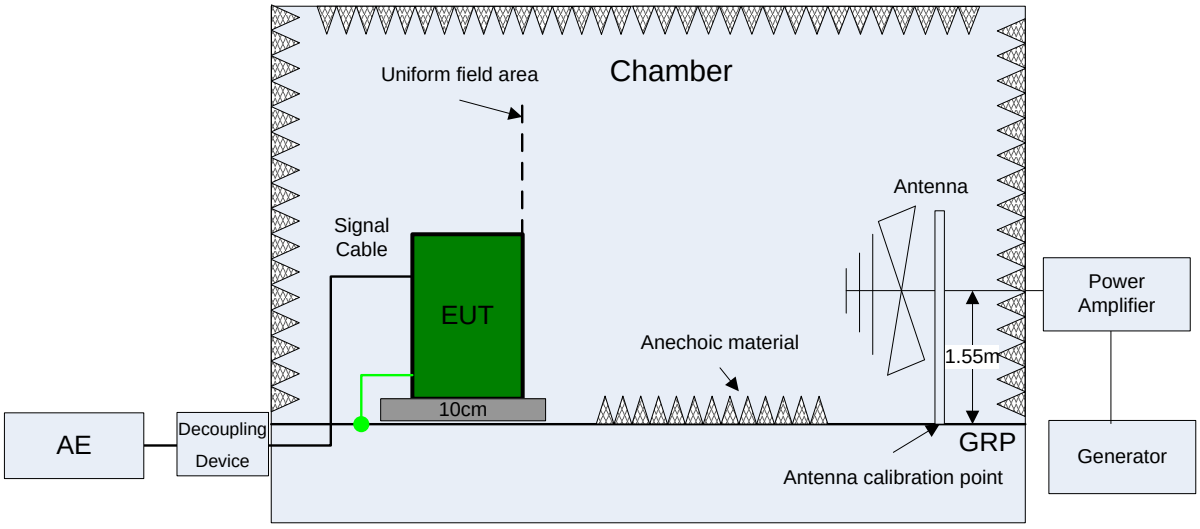

Figure 8. Test set-up of immunity to radiated electric fields

7.2.2 Test Results

The EUT has met the requirements of Performance Criterion CT&CR defined in chapter 5 for Immunity to Radiated Electric Fields of enclosure port.

Table 12 Test results

Test side of EUT	Front, Rear, Left, Right
Frequency range & Test Level	80MHz-800MHz test level: 10 V/m(Unmodulated, rms) 800MHz –1000MHz test level: 20 V/m(Unmodulated, rms) 1000MHz –2700MHz test level: 10 V/m(Unmodulated, rms)
Modulation method	80% Amplitude modulation at 1kHz sine wave
Exclusion band	Transmit Band: 925 MHz~960 MHz (GSM900) 1805 MHz~1880 MHz (DCS1800) Receive Band: 880 MHz~915 MHz(GSM900) 1710 MHz~1785 MHz(DCS1800)
Swept-Frequency Dwell Time:	1 second
Maximum Step Size:	1%
Special frequency points	80 MHz, 120 MHz, 160 MHz, 230 MHz, 434 MHz, 460 MHz, 600 MHz, 863 MHz, 900 MHz (±1%).122.88 MHz; 104 MHz
Special Frequencies Dwell Time:	60 seconds
Criterion	CT&CR
Conclusion	Pass

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7.3 Immunity to Electrical Fast Transient Bursts

7.3.1 Test Procedure

The EUT was configured as described in section 4. A series of fast transient bursts meeting the specification were applied for a period of 120 seconds. The transient bursts were applied for both Positive and Negative Burst Trains to each type of signal port and power Port. The set-up and test methods were in accordance with IEC 61000-4-4 standard.

Table 13 Parameter of single pulse and fast transient /burst

Rise Time of single pulse (Tr):	5 ns
Duration of single pulse (Th):	50 ns
Pulse Repetition Rate:	5 kHz
Burst Duration :	15 ms
Burst Period:	300 ms

The test set-up diagram was shown as below:

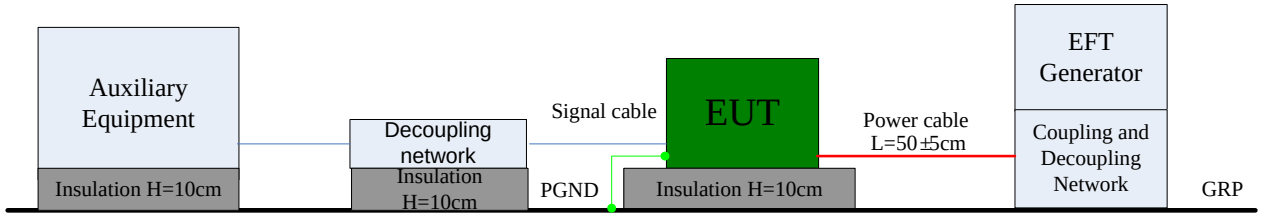

Figure 9. Test set-up of immunity to electrical fast transient bursts for power port

7.3.2 Test Results

The EUT has met the requirements of Performance Criterion CT&CR defined in chapter 5.

Table 14 Test results of DC power port

Ports	Measuring condition	Couple mode	Description	Conclusion
DC Power Port	Common mode coupling Level: ±2 kV, Duration: 2 minutes	-48V RTN PE -48V+RTN RTN+PE -48V+PE -48V+RTN+PE	No failure detected	Pass

Note: RTN=RETURN LEAD

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7.4 Immunity to Surges

7.4.1 Test Procedure

The EUT was configured as described in section 4 for this test. The set-up and test methods were in accordance with IEC 61000-4-5 standard.
The test set-up diagram was shown as below:

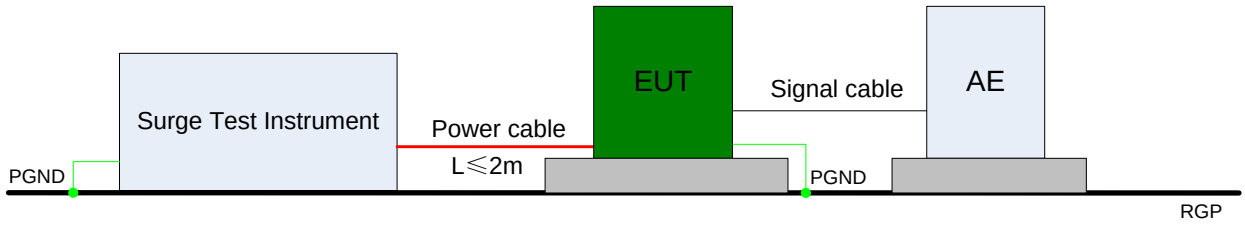

Figure 10. Test set-up of immunity to surge for power port

7.4.2 Test Results

The EUT has met the requirements of Performance Criterion TT&TR defined in chapter 5.

Table 15 Test results of DC power port

Ports	Measuring condition	Description	Conclusion
DC Power Port	Line to Line,-48V-RTN Level:±1 kV, repeat 5 times each Polarity Tr/Th:1.2/50 μs Interval: 60 seconds Phase: Asyn Line to Ground, -48V-PE,RTN-PE, -48V+RTN-PE Level:±2.0 kV, repeat 5 times each Polarity Tr/Th:1.2/50 μs Interval: 60 seconds Phase: Asyn	No failure detected	Pass

Note: RTN=RETURN LEAD

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7.5 Immunity to Continuous Conducted Interference 0.15 MHz to 80 MHz

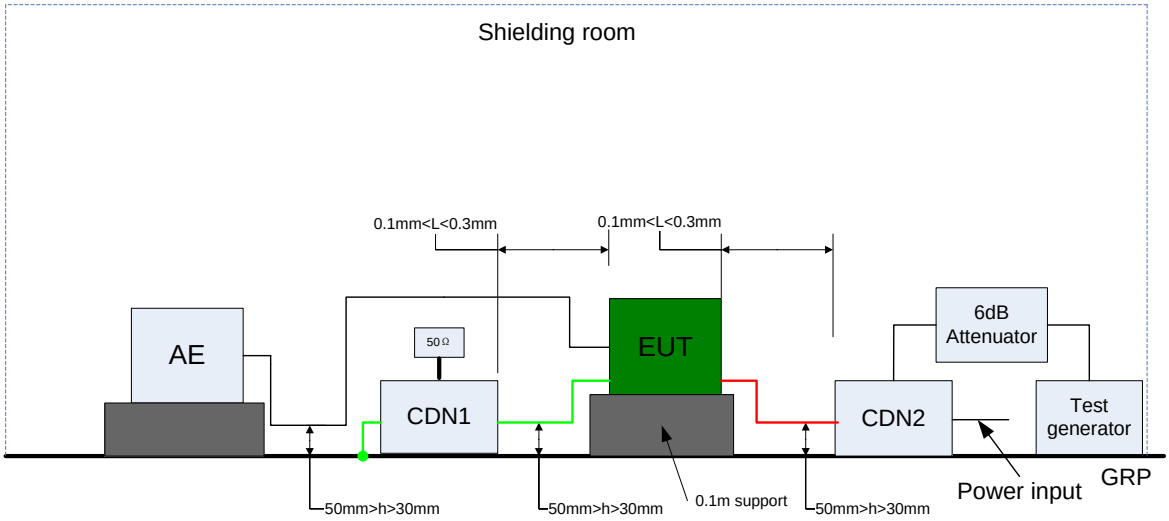
7.5.1 Test Procedure

The EUT was configured as described in section 4. The applied level was amplitude modulated by a 1 kHz sinusoidal signal to a modulation depth of 80%. The set-up and test methods were in accordance with IEC 61000-4-6 standard.

Table 16 Test requirements

Sweep Frequency Range:	0.15 MHz to 80 MHz
Field Modulation:	80% Amplitude modulation at 1kHz sine wave
Maximum Step Size:	1%
Swept-Frequency Dwell Time:	1 second
Special Frequency point:	0.2 MHz; 1.0 MHz; 7.1 MHz; 13.56 MHz; 21.0 MHz; 27.12 MHz; 40.68 MHz; 3.25 MHz; 50 MHz; 52 MHz;
Special Frequency Dwell Time:	60 seconds

The test set-up diagram was shown as below:



The cable connected to the EUT:
Red: power cable; Green: earth cable; Black: signal cable

Figure 11. Test set-up of immunity to continuous conducted interference for power port

7.5.2 Test Results

The EUT has met the requirements of Performance Criterion CT&CR for Immunity to Continuous Conducted Interference

Table 17 Test results of DC power port

Ports	Test Level	Inject method	Description	Conclusion
DC Power Port	10 V	CDN-M2	No failure detected	Pass
Earth	10 V	CDN-M1	No failure detected	Pass

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7.6 Immunity to Pulse Magnetic Field

7.6.1 Test Procedure

The EUT was configured as described in section 4 for this test. The set-up and test methods were according to IEC 61000-4-9.
The test set-up diagram was shown as below:

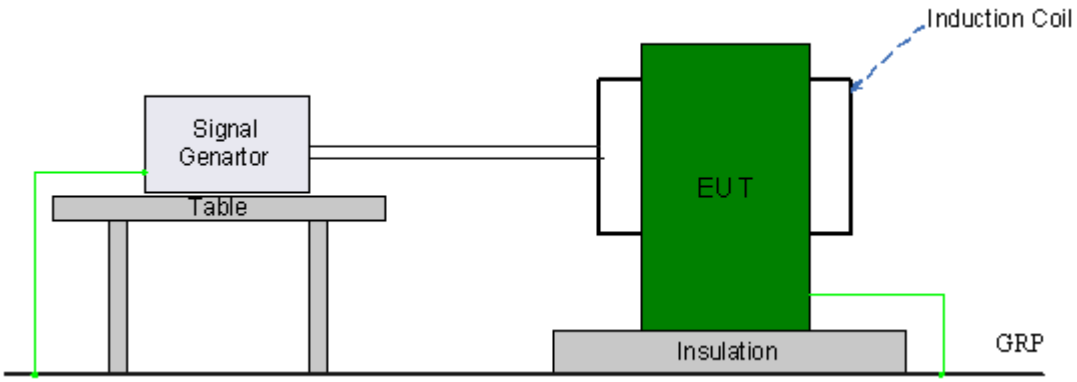

Figure 12. Test set-up of immunity to pulse magnetic field

7.6.2 Test Results

The EUT has met the requirements of Performance Criterion TT&TR for Immunity to Power Frequency Magnetic Field of enclosure port.

Table 18Test Results

Coil Position	Three orthogonal position X Y Z
Test Level	300 A/m
Duration Time	1min
Criterion	TT&TR
Description	No failure detected
Conclusion	Pass

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7.7 Immunity to Voltage Dips and Short Interruption and Voltage Variation of DC Power Port

7.7.1 Test Procedure

The EUT was configured as described in section 4. The set-up and test methods were in accordance with IEC 61000-4-29 standard.

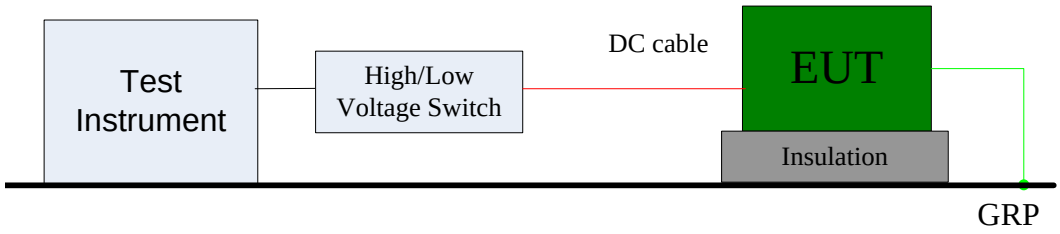

Figure 13. Test Set-up of Voltage Dips and Short Interruption and Voltage Variation of DC Power Port

7.7.2 Test Results

The EUT has met the requirements Performance Criterion defined in section 5.

Table 19 Test results

Test Items	Measuring Condition	Performance Criterion		Description	Conclusion
Voltage dips	Voltage reduction 60% Duration: 1 ms, 3 ms, 10 ms, 30ms, 100 ms, 300 ms, 1000 ms Interval: 10 s Repeat 3 times	Refer to 5.3	☐With battery ☒Without battery	No failure detected	Pass
	Voltage reduction 30% Duration: 1 ms, 3 ms, 10 ms, 30ms, 100 ms, 300 ms, 1000 ms Interval: 10 s Repeat 3 times	Refer to 5.3	☐With battery ☒Without battery	No failure detected	Pass
Short interruption	High Impedance Duration: 1 ms, 3 ms, 10 ms, 30ms, 100 ms, 300 ms, 1000 ms Interval: 10 s Repeat 3 times	Refer to 5.3	☐With battery ☒Without battery	No failure detected	Pass
	Low Impedance Duration: 1 ms, 3 ms, 10 ms, 30ms, 100 ms, 300 ms, 1000 ms Interval: 10 s Repeat 3 times	Refer to 5.3	☐With battery ☒Without battery	No failure detected	Pass
Voltage variation	Variation level:80% Duration: 0.1 s, 0.3 s, 1 s, 3 s, 10 s Interval: 10s Repeat 3 times	CT&CR		No failure detected	Pass
	Variation level:120% Duration: 0.1 s, 0.3 s, 1 s, 3 s, 10 s Interval: 10 s Repeat 3 times	CT&CR		No failure detected	Pass

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8 Main Test Instruments

Table 20 Main test instrument

Test item	Test Instrument	Model	Manufacturer	Calibration Date	Calibration Interval (month)
Radiated Emission	EMI Test receiver	ESU40	R&S	2011-05-05	12
	Broadband Antenna	CBL 6112B (2747)	SCHAFFNER	2010-12-11	12
	Horn Antenna	HF906	R&S	2011-05-08	12
	Chamber _NSA	N/A	S+M	2011-03-02	12
Radiated Spurious Emissions	EMI Test receiver	ESU40	R&S	2011-05-05	12
	Broadband Antenna	CBL 6112B	SCHAFFNER	2010-10-09	12
	Horn Antenna	HF906	R&S	2011-05-08	12
Conducted Emission	EMI Test receiver	ESCI 3	R&S	2011-05-05	12
	Artificial Mains Network	ENV4200	R&S	2011-05-13	12
Electrostatic Discharge	ESD Simulator	NSG438	SCHAFFNER	2010-11-24	12
Immunity to Radiated Electric Fields	Signal Generator	SMT06	R&S	2011-05-13	12
	Broadband Antenna	HL562	R&S	N/A	12
	Amplifier	250W1000	AMPLIFIER RESEARCH	2011-05-13	12
	Amplifier	25S1G4A	AMPLIFIER RESEARCH	2011-05-13	12
	Chamber_FU	N/A	S+M	2011-03-02	12
Electrical Fast Transient Bursts	Fast Transient Burt Simulator	NSG2025	SCHAFFNER	2011-05-13	12
SURGE	High Energy Pulse Generator	PSURGE 8000	HAEFELY	2010-12-14	12
Immunity to Continuous Conducted Interference	Signal Generator	SMY01	R&S	2011-05-13	12
	Amplifier	250A250	AMPLIFIER RESEARCH	2011-05-13	12
	Coupling Decoupling Network	CDN-801-M2/M3	LUTHI	2011-05-13	12
	Coupling Decoupling Network	CDN-M1/32	EM TEST	2011-05-13	12
	6dB Attenuator	75A-FFN-06	Bird	2011-05-13	12
Immunity to Pulse	Signal Generator	UCS500 M6B	EMTEST	2011-05-13	12

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Magnetic Field					
Voltage Dips, Short Interruptions, and Voltage Variations of DC Power Ports	Programmable Power	PCR6000L	KIKUSUI	2011-05-13	12

Software Information			
Test Item	Software Name	Manufacturer	Version
Radiated Emission	ES-K1	R&S	1.7.1
Radiated Spurious Emissions	ES-K1	R&S	1.7.1
Conducted Emission	ES-K1	R&S	1.7.1
Immunity to Radiated Electric Fields	EMS-K1	R&S	1.20SR2
Immunity to Continuous Conducted Interference	EMS-K1	R&S	1.20SR2
Voltage Dips, Short Interruptions, and Voltage Variations of DC Power Ports	DC-DIP	Huawei	2.0

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9 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

Table 21 System measurement uncertainty

Items		Extended Uncertainty
Radiated Emission	Field strength (dBμV/m)	U=4.15 dB; k=2 (30 MHz-1 GHz)
		U=4.20 dB; k=2 (1 GHz-6 GHz)
Radiated Spurious Emissions	ERP (dBm)	U=3.8dB; k=2
Conducted Emission	Disturbance Voltage (dBμV)	U=3.3dB; k=2
Electrostatic Discharge	Voltage (V)	U=11%; k=2
Immunity to Radiated Electric Fields	Field strength (V/m)	U=30%; k=2
Electrical Fast Transient Bursts	Voltage (V)	U=14%; k=2
SURGE	Voltage (V)	U=4.6%; k=2
Immunity to Continuous Conducted Interference	Voltage (V)	U=30%; k=2
Immunity to Pulse Magnetic Field	Voltage (V)	U=5.2%; k=2
Voltage Dips, Short Interruptions, and Voltage Variations of DC Power Ports	Voltage dips U (V)	U=4.8%; k=2
	Short interruption U (V)	U=4.8%; k=2

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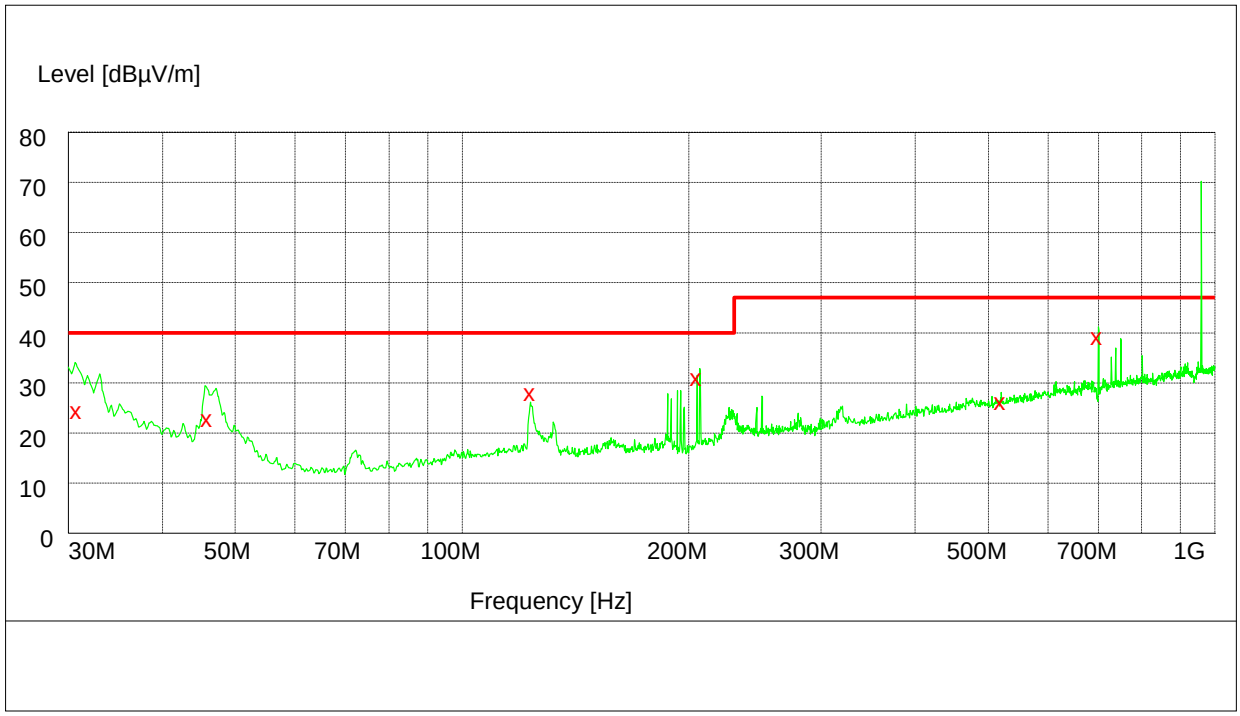
10 Graph and Data of Emission Test

10.1 Radiated Emission

10.1.1 Radiated Emission of TC1 (30 MHz-1 GHz)



Measurement Result: QP Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
30.840000	25.60	-5.8	40.0	14.4	100.0	117.00	VERTICAL
45.960000	23.90	-14.4	40.0	16.1	107.0	302.00	VERTICAL
123.540000	10.30	-14.9	40.0	29.7	126.0	353.00	VERTICAL
205.260000	8.20	-13.2	40.0	31.8	210.0	125.00	HORIZONTAL
519.960000	19.90	-5.1	47.0	27.1	135.0	185.00	VERTICAL
699.960000	40.30	-4.1	47.0	6.7	107.0	252.00	HORIZONTAL

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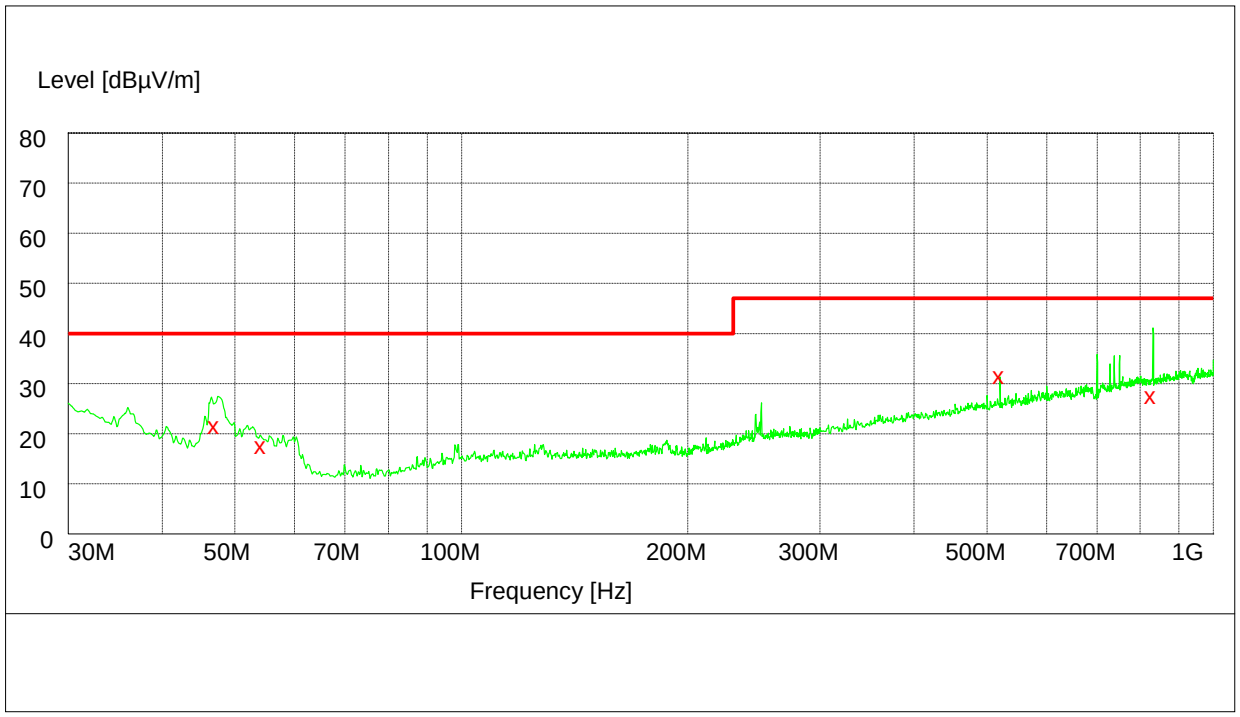
10.1.2 Radiated Emission of TC2 (30 MHz-1 GHz)



Measurement Result: QP Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
47.040000	22.30	-14.9	40.0	17.7	107.0	360.00	VERTICAL
54.300000	18.50	-17.1	40.0	21.5	107.0	0.00	VERTICAL
519.960000	32.70	-5.1	47.0	14.3	135.0	0.00	VERTICAL
828.900000	28.30	-0.3	47.0	18.7	100.0	0.00	VERTICAL

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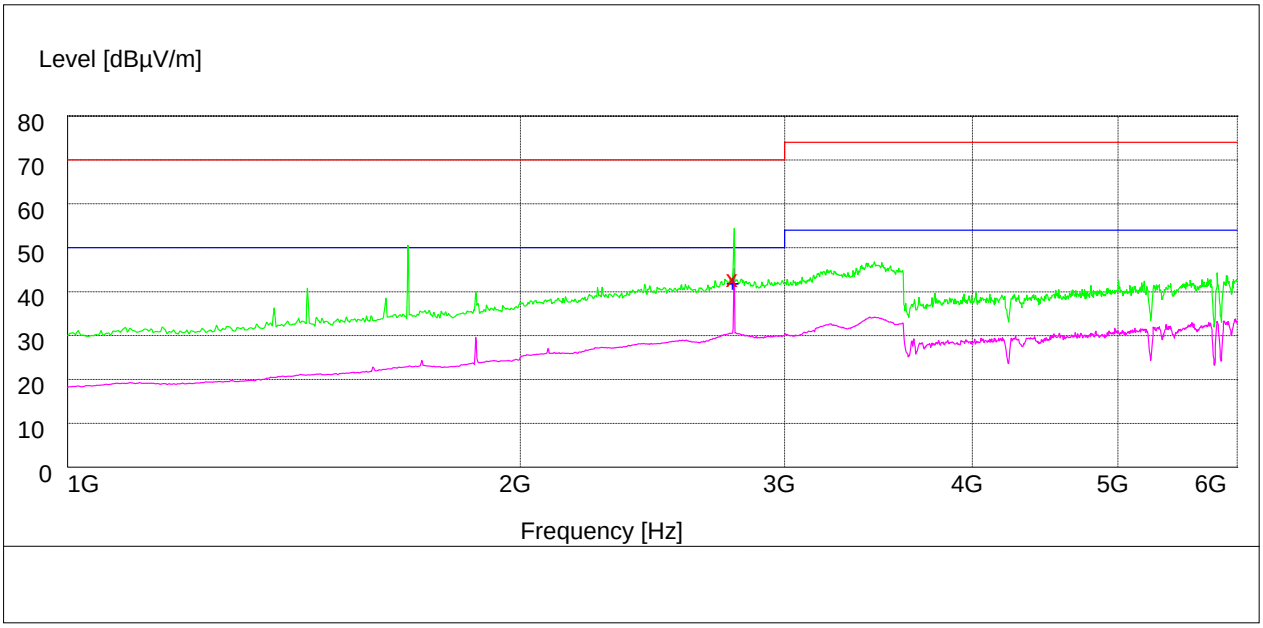
10.1.3 Radiated Emission of TC1 and TC2 (1-6 GHz)



Measurement Result: PK Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
2775.500000	44.50	1.6	70.0	25.5	100.0	286.00	VERTICAL

Measurement Result: AV Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
2775.500000	43.20	1.6	50.0	6.8	110.0	346.00	VERTICAL

This is the worse result of TC1 and TC2.

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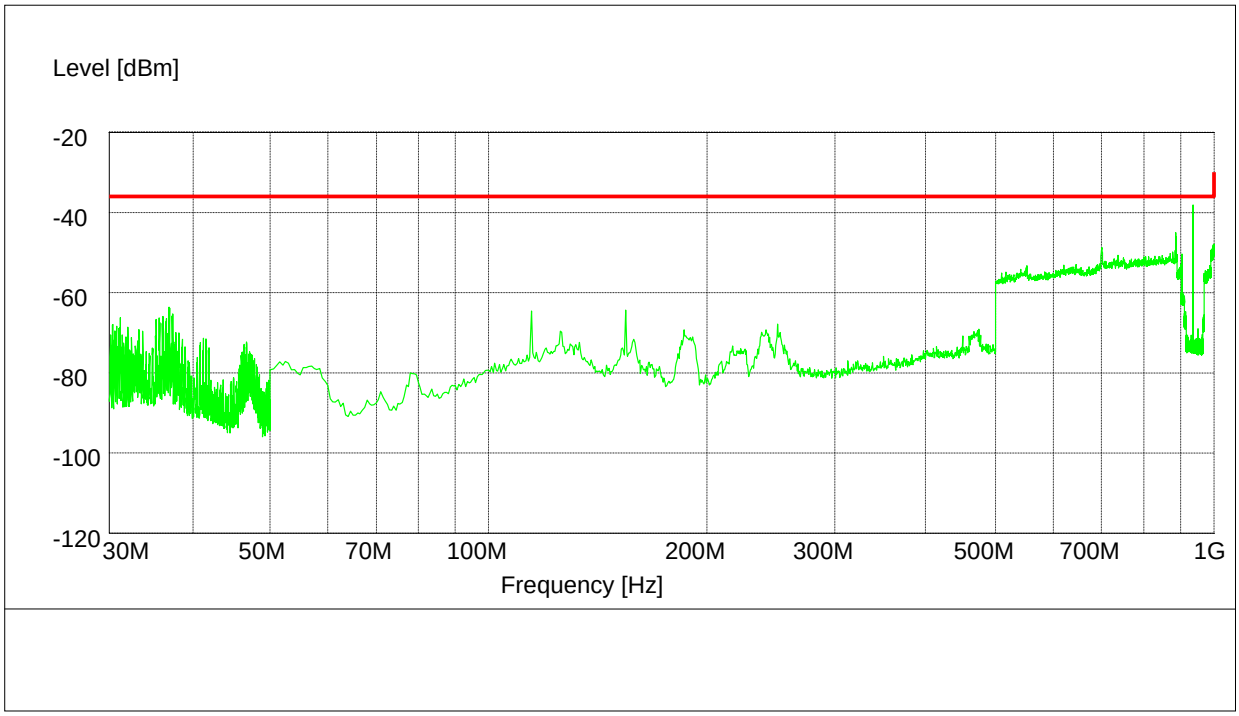
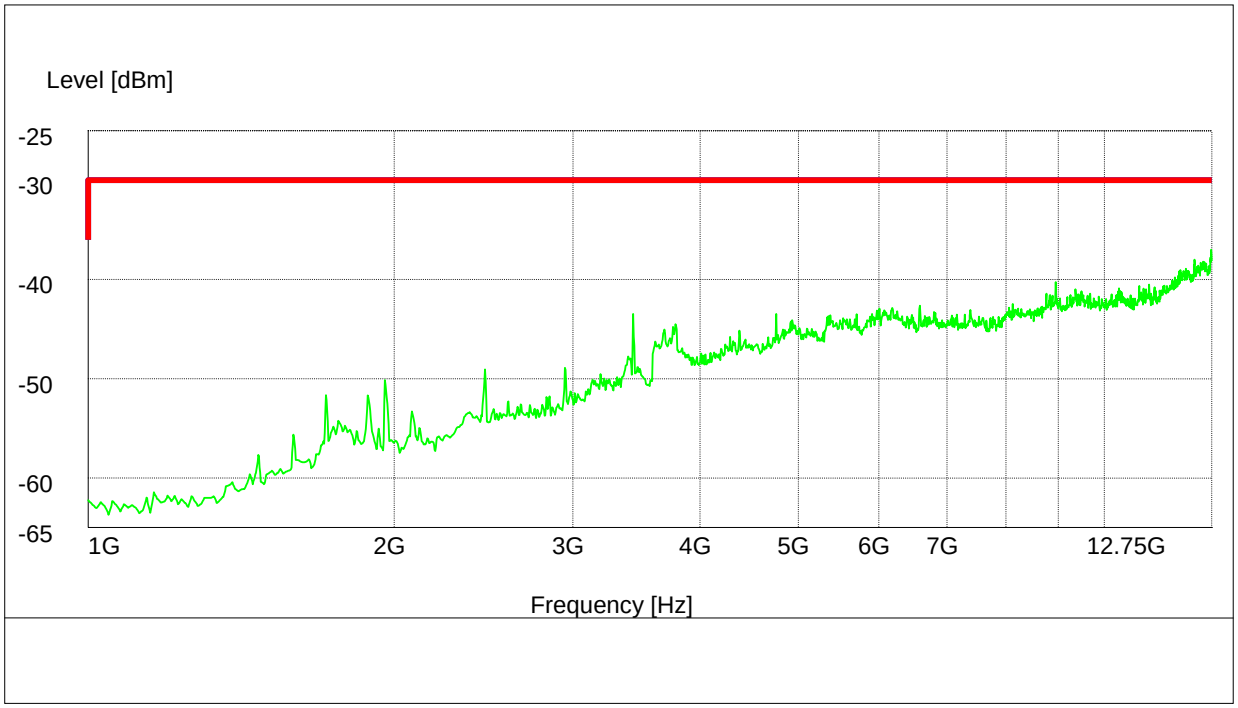
10.2 Radiated Spurious Emission

10.2.1 Radiated Spurious Emission for GSM 900M



30M~1GHz



1GHz~12.75GHz

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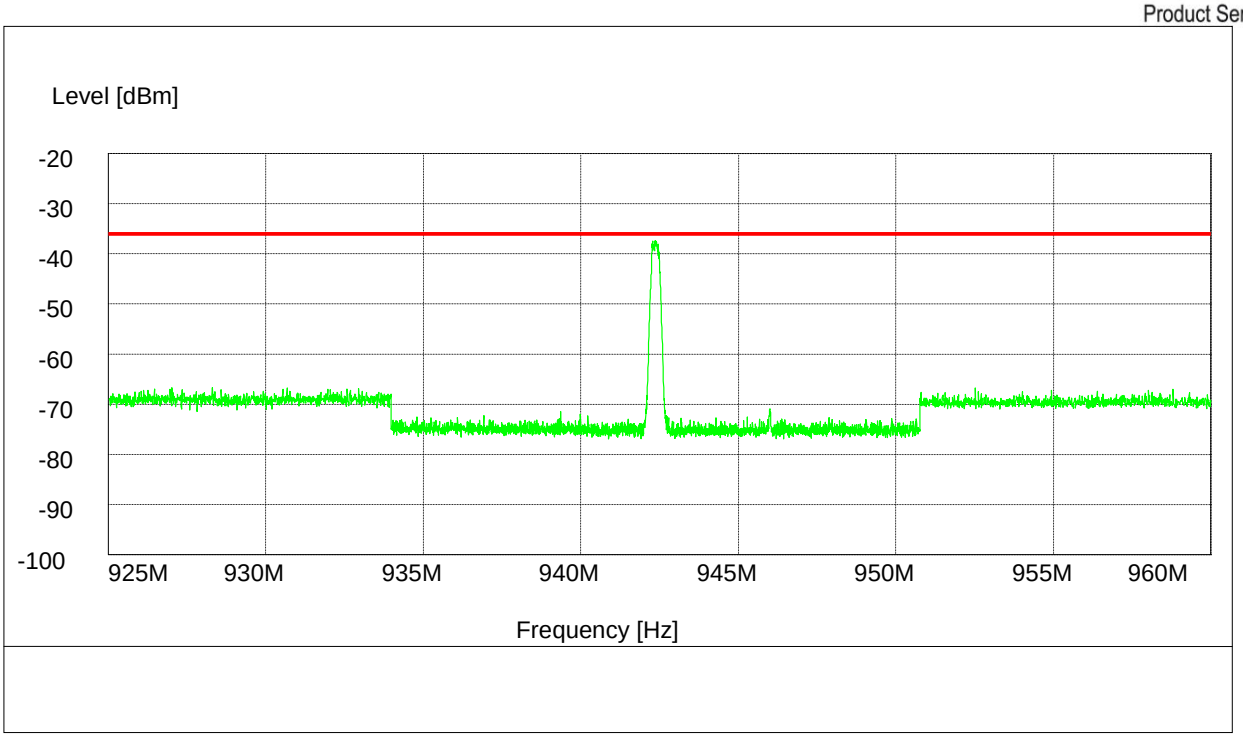

925MHz~960MHz (in band)

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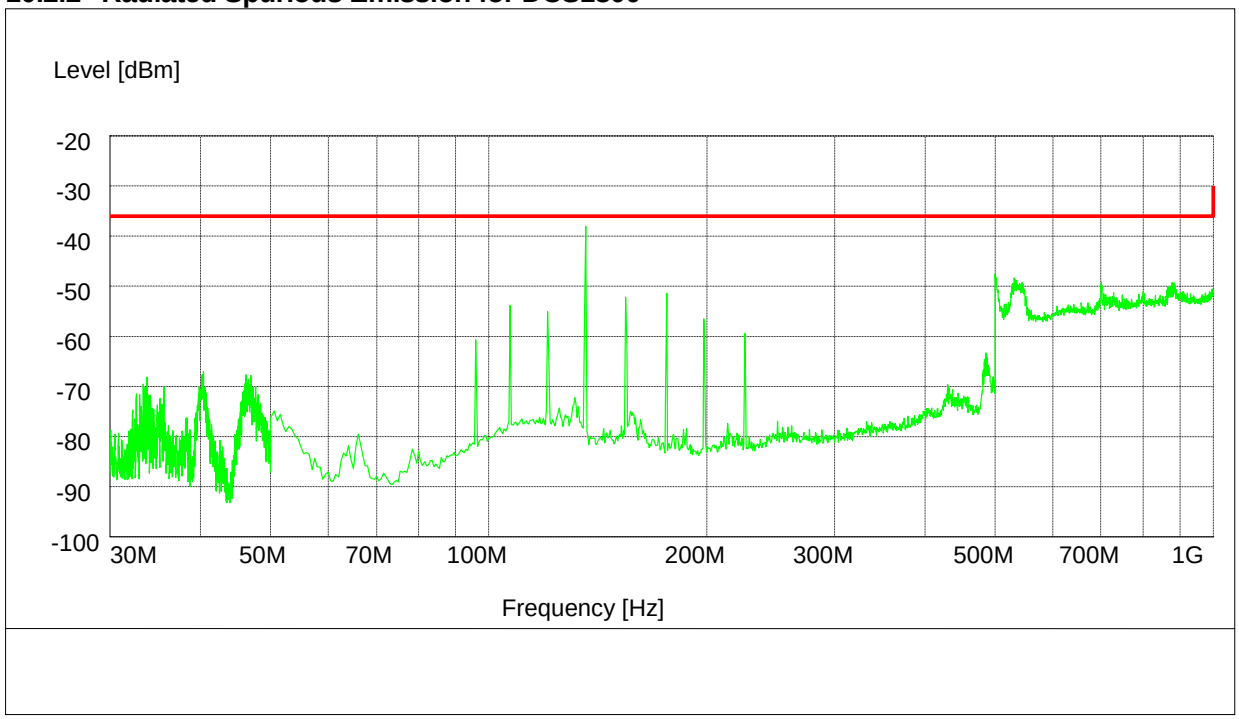
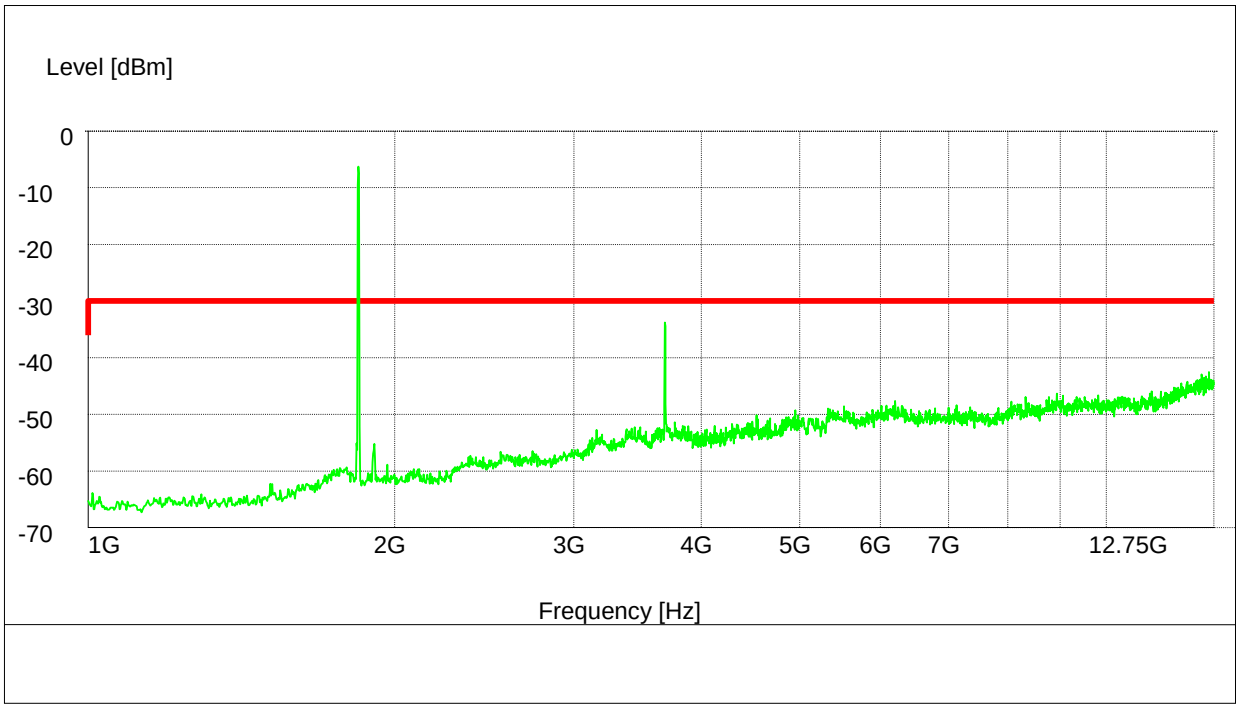
10.2.2 Radiated Spurious Emission for DCS1800



30MHz~1GHz



1GHz~12.75GHz

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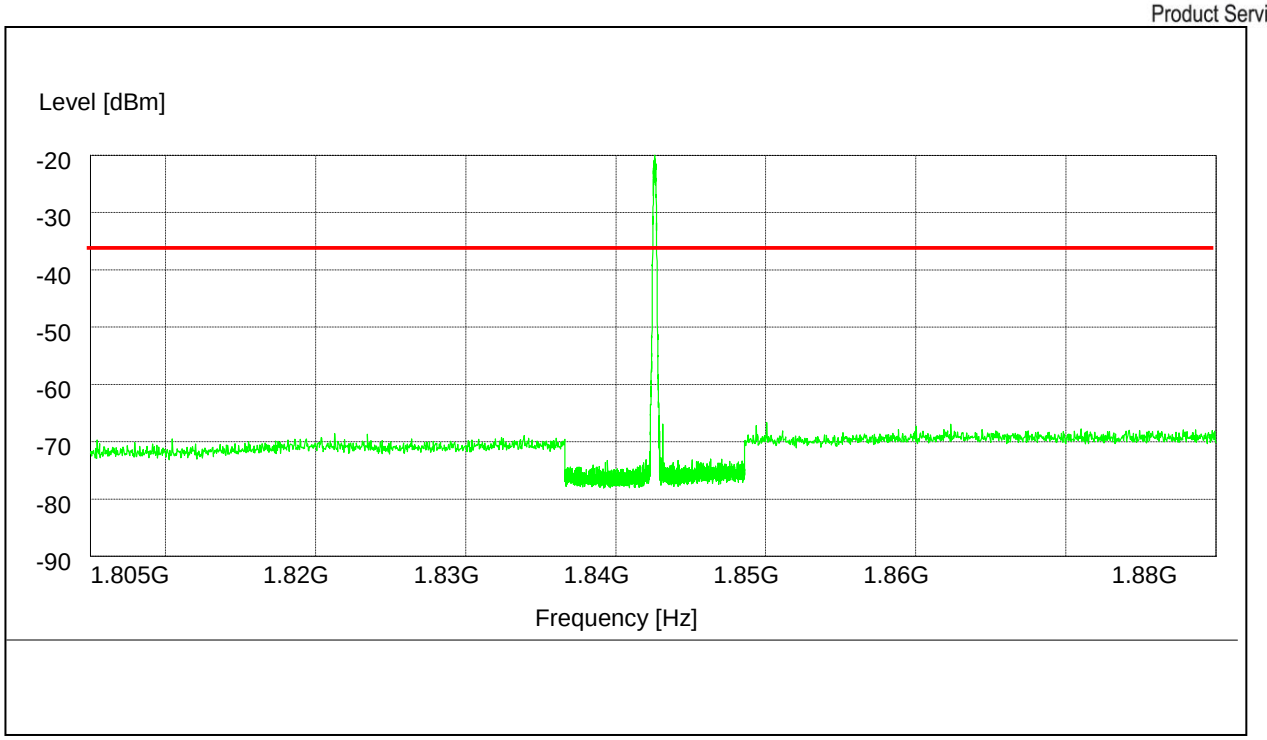

1805MHz~1880MHz (in band)

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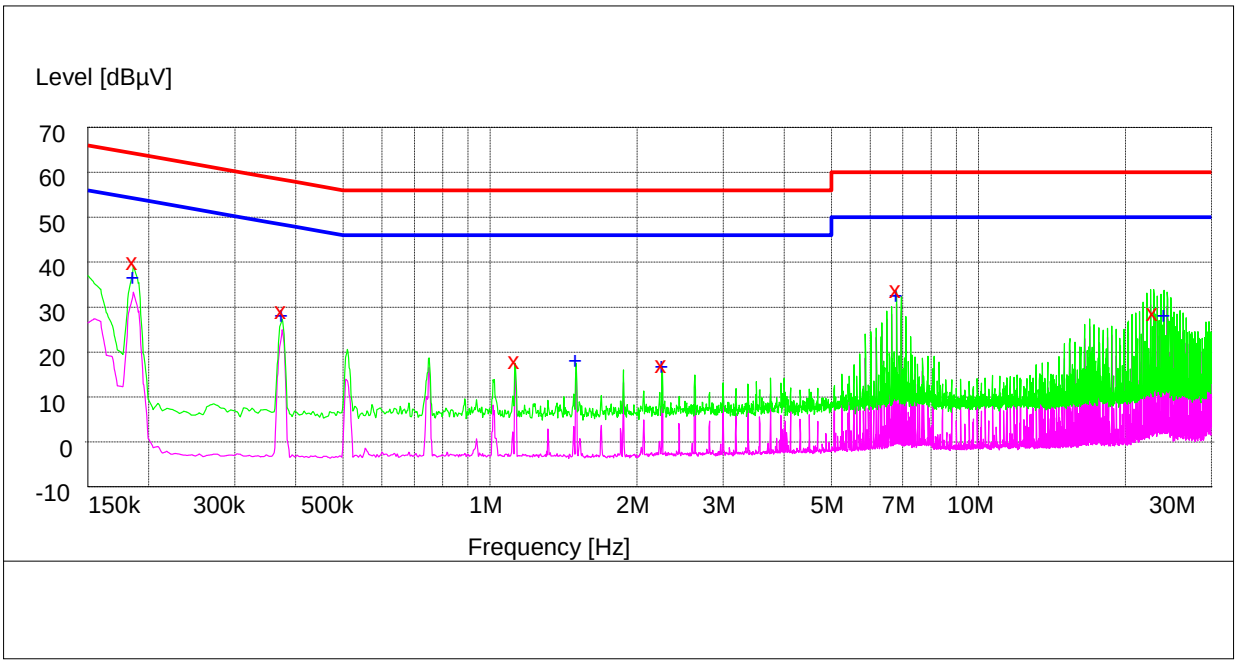
10.3 Conducted Disturbance

10.3.1 DC Power Port Test Data of TC1



Measurement Result: QP Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.186000	41.50	10.1	64	22.7	L3	GND
0.375000	30.60	10.0	58	27.8	L3	GND
1.126500	19.60	10.1	56	36.4	N	GND
2.251500	18.50	10.1	56	37.5	N	GND
6.796500	35.30	10.1	60	24.7	L3	GND
22.875000	30.10	10.4	60	29.9	L3	GND

Measurement Result: AV Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.186000	38.00	10.1	54	16.2	L3	GND
0.375000	29.30	10.0	48	19.1	L3	GND
1.500000	19.40	10.0	46	26.6	N	GND
2.251500	18.10	10.1	46	27.9	N	GND
6.796500	33.80	10.1	50	16.2	N	GND
24.004500	29.50	10.4	50	20.5	L3	GND

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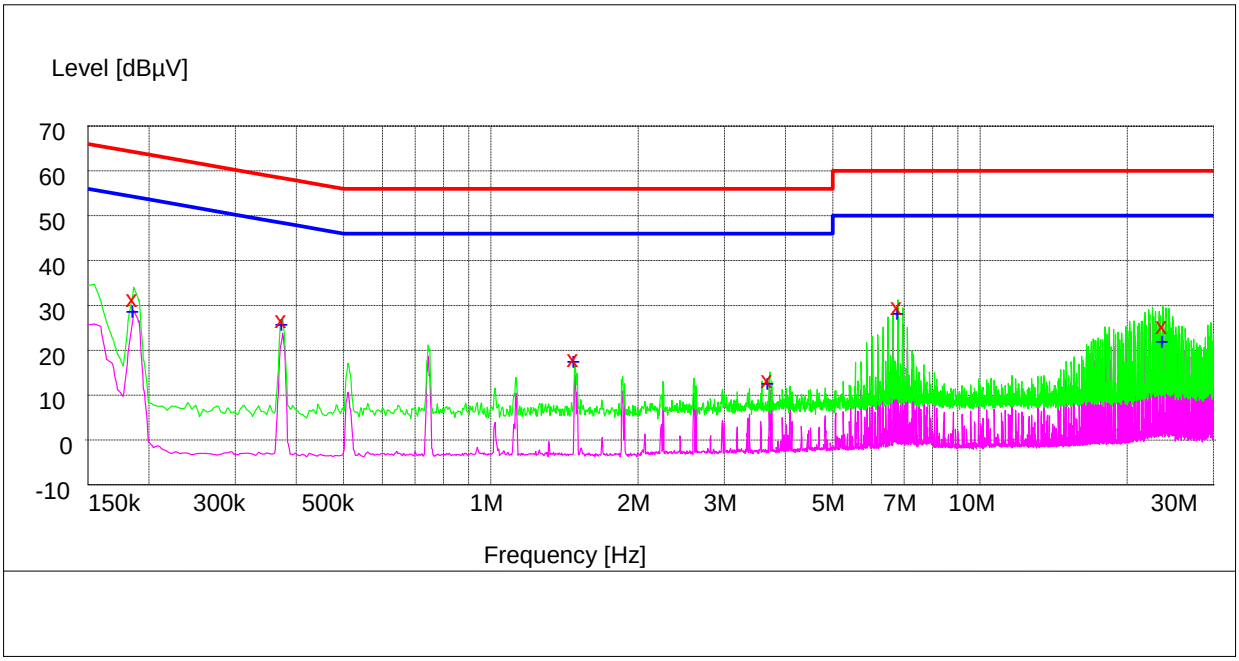
10.3.2 DC Power Port Test Data of TC2



Measurement Result: QP Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.186000	33.00	10.1	64	31.2	L3	GND
0.375000	28.20	10.0	58	30.2	N	GND
1.482000	19.40	10.0	56	36.6	N	GND
3.700500	14.80	10.1	56	41.2	N	GND
6.796500	31.10	10.1	60	28.9	L3	GND
23.622000	26.90	10.4	60	33.1	L3	GND

Measurement Result: AV Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.186000	30.00	10.1	54	24.2	L3	GND
0.375000	27.00	10.0	48	21.4	N	GND
1.482000	18.80	10.0	46	27.2	N	GND
3.700500	13.80	10.1	46	32.2	N	GND
6.796500	29.50	10.1	50	20.5	L3	GND
23.622000	23.30	10.4	50	26.7	L3	GND

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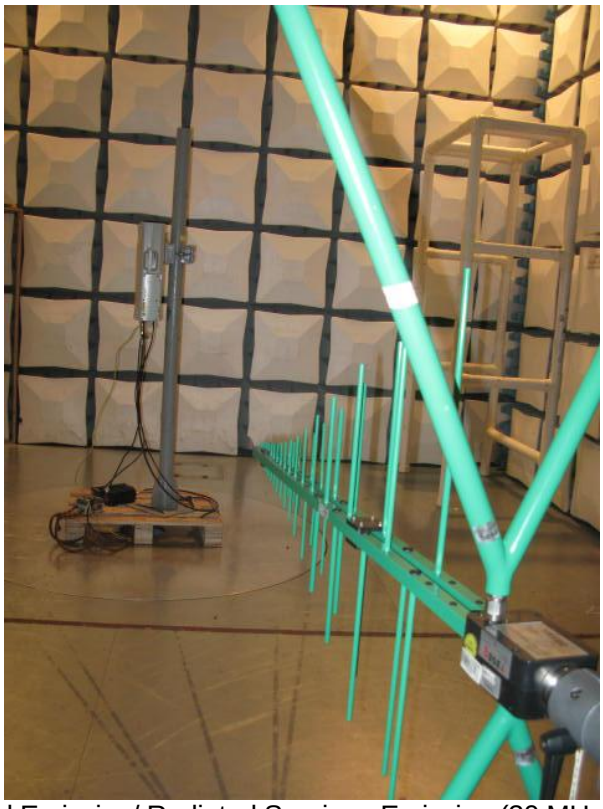
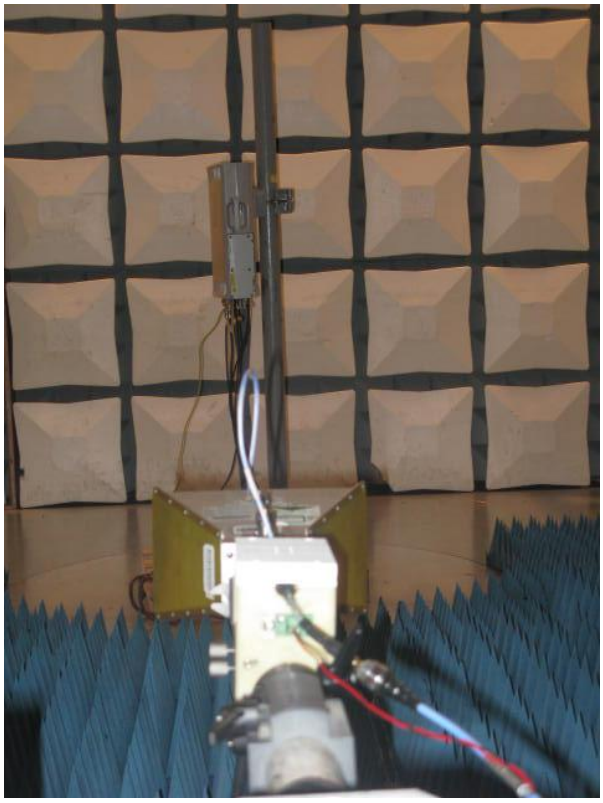
11 Photographs of Test Set-up

11.1 Emissions



Radiated Emission/ Radiated Spurious Emission (30 MHz-1 GHz)



Radiated Emission (above 1 GHz)

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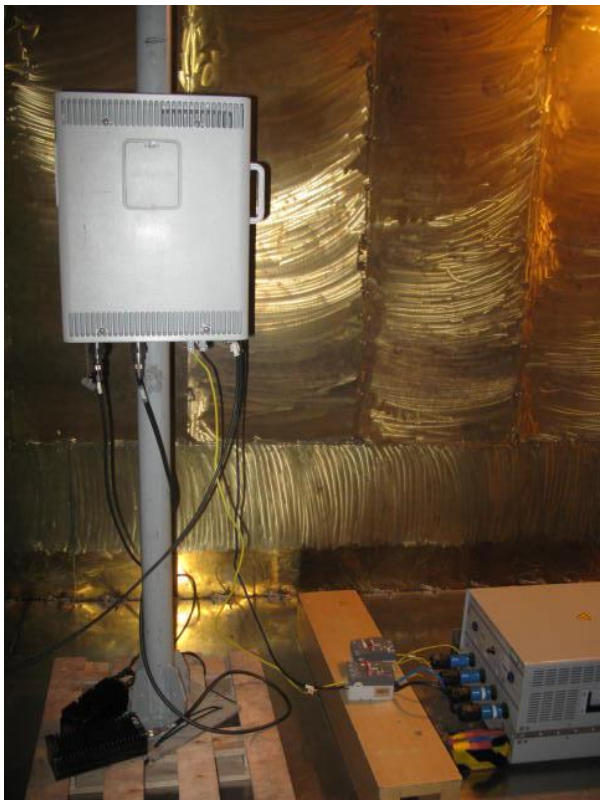
Radiated Spurious Emission (above 1 GHz)



Conducted Emissions of DC Power Port

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11.2 Immunity

Immunity to Radiated Electric Fields

Electrostatic Discharge

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Immunity to Electrical Fast Transient Bursts of DC Power Port

Immunity to Surges of DC Power Port

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Immunity to Continuous Conducted Interference of DC Power Port

Immunity to Pulse Magnetic Field

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Immunity to Voltage Dips, Short Interruption and Voltage Variation of DC Power Port

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Appendix: Abbreviation

Table 22 Abbreviation

Abbreviation	Full Name
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
EMI	Electromagnetic Interference
EMS	Electromagnetic Susceptibility
EUT	Equipment Under Test
AE	Auxiliary Equipment
DC	Direct Current
NSA	Normalized Site Attenuation
S_{VSWR}	Site Voltage Standing Wave Ratio
LISN	Line Impedance Stabilization Network
CDN	Coupling and Decoupling Network
TC	Test configuration
NT	Not Test
NA	Not Applicable

END

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